①
4/14/03

(19)日本国特許庁（JP）　(12) 公開実用新案公報（U）　(11)実用新案出願公開番号
実開平5－90809
(1993)
(43)公開日　平成5年(1993)12月10日

(51)Int.Cl.⁵	識別記号	庁内整理番号	F I	技術表示箇所
H01M 2/12	Z			
	101			
2/02	A			
	J			

NO APPEAL FILED
– ABANDONED –

審査請求　未請求　請求項の数1（全 2 頁）

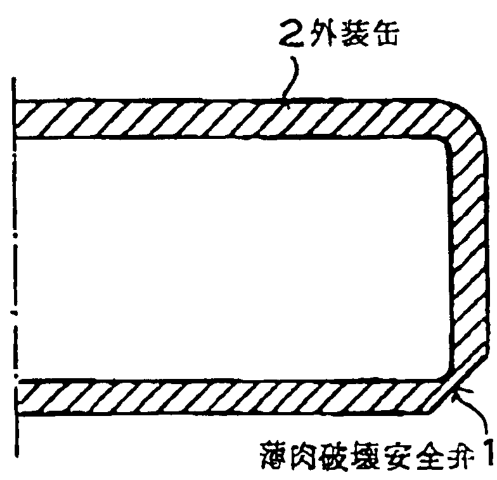
(21)出願番号　実願平4－34193
(22)出願日　平成4年(1992)5月22日

FILED
1992

(71)出願人　000001889
三洋電機株式会社
大阪府守口市京阪本通2丁目18番地
(72)考案者　岡堤　徹
大阪府守口市京阪本通2丁目18番地　三洋電機株式会社内
(74)代理人　弁理士　豊栖　康弘

(54)【考案の名称】　安全弁を備える角形電池

(57)【要約】
【目的】　薄肉破壊安全弁の作動圧を正確に制御して、高信頼性の角形電池とする。
【構成】　角形電池は、電極群を外装缶2に収納し、開口部を封口板で閉塞している。外装缶2の一部を薄く加工して、内圧で破損する薄肉破壊安全弁1を設けている。外装缶は角形で、薄肉破壊安全弁1は、外装缶2の封口部以外の陵の一部に設けている。
【効果】　薄肉破壊安全弁を外装缶の陵に設けているので、正確な作動圧で破損する。陵に設けた薄肉破壊安全弁は、内圧が上昇しても、角形電池を膨らませる等の変形の原因とならない。



1. GRIND EDGE 1 M.

2. EXAMPLES INCLUDE PUTTING GROOVES ON -DIAGONALS-

(19) JAPANESE PATENT OFFICE (JP)

(12) Official Gazette for Laid-Open Utility Model Applications (U)

(11) Japanese Laid-Open Utility Model Application (Kokai) No. 5[1993]-90,809

(43) Laying-Open Date: 10 December 1993

(51) Int.Cl.[2]	Ident. Symbols		Internal Office Nos.
H 01 M 2/12		Z	
	101		
2/02		A	
		J	

Request for Examination: Not yet requested

Number of Claims: 1 Total of 2 pages)

(21) Application No.: 4[1992]-84,193

(22) Application Date: 22 May 1992

(71) Applicant: 00001889
Sanyo Battery Company, Ltd.
18 Keihan Hondori 2-chome, Moriguchi-shi, Osaka-fu

(72) Inventor: Tetsu Amatsutsumi
c/o Sanyo Battery Company, Ltd.
18 Keihan Hondori 2-chome, Moriguchi-shi, Osaka-fu

(74) Agent: Yasuhiro Kaisei, Patent Attorney

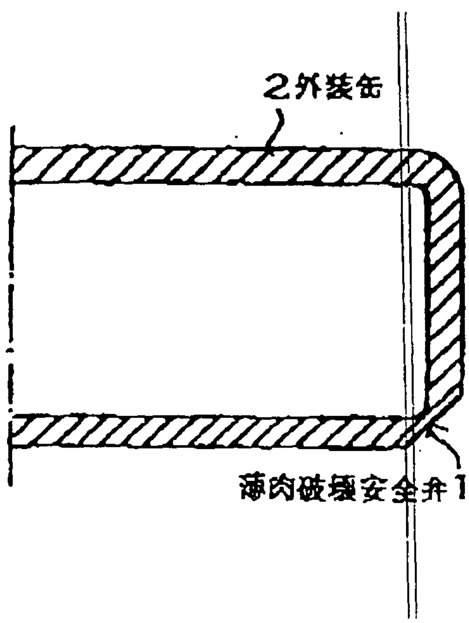
(54) [Name of Device]: A Rectangular Battery Equipped with a Safety Valve

(57) [Abstract]

[Objective] A rectangular battery of high reliability in which the operating pressure of the thin breakage safety valve is precisely controlled.

[Structure] In the rectangular battery, the electrode assembly is housed in the packing canister 2 and the opening is sealed by a sealing plate. A portion of the packing canister 2 is processed to a thin state and the thin breakage safety valve 1 that is broken down by internal pressure is installed. The packing canister is rectangular and the thin breakage safety valve 1 is intalled in a part of the corner at a place other than where the sealing plate of the packing canister 2 is installed.

[Effect] Because the thin breakage safety valve is installed in a corner of the packing canister, breakage occurs at a precise operating pressure. The thin breakage safety valve, which is installed in the corner edge, is not the cause of deformation such as swelling of the rectangular battery even when internal pressure rises.



[keyed top to bottom]:

2 – packing canister

1 – thin breakage safety valve

[Claim]

A rectangular battery that has a safety valve, which is characterized

in that it is a rectangular battery in which an electrode assembly having an anode and a cathode are housed in the packing canister (2), in which the opening window of the packing canister (2) is sealed by the sealing plate (3), in which a part of the packing canister (2) is processed to a thin state and in which is installed the thin breakage safety valve (1) that breaks under internal pressure, [and]

in that the packing canister (2) is rectangular and in that the thin breakage safety valve (1) is installed in a part of the corner other than the place where the sealing plate is installed.

[Brief Explanation of the Figures]

[Figure 1] This is an oblique view of a battery that has a conventional thin breakage safety valve.

[Figure 2] This is a cross-sectional view of the sealing plate that is used in the batteries of Example A and Comparative Examples B and D.

[Figure 3] This is a cross-sectional view that shows the battery of the packing canister that is important in Example A.

[Figure 4] This is a frontal view of the battery of Example A.

[Figure 5] This is a cross-sectional view of the sealing plate that is used in the battery of Comparative Example C.

[Figure 6] This is a frontal view of the battery of Comparative Example D.

[Explanation of Symbols]

1 ----- thin breakage safety valve

2 ----- packing canister

3 ----- sealing plate

4 ----- insulating material

5 ----- terminal

6 ----- sealing element

7 ----- valve cap; 7A – metal plate; 7B – metal plate

8 ----- rubber valve

9 ----- gas outlet

10 --- valve opening

Fig. 1

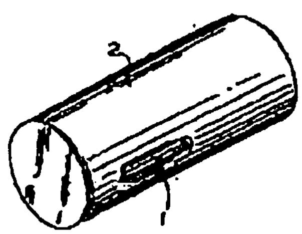


Fig. 2

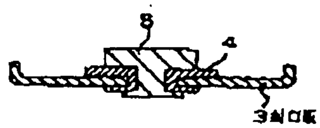


Fig. 3

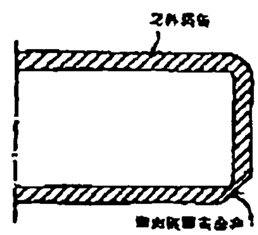
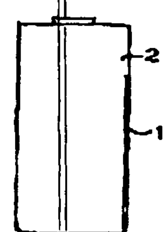
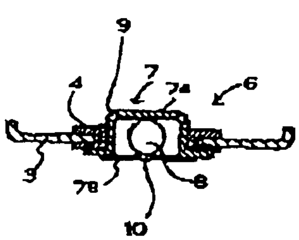


Fig. 4



【図6】

【図5】



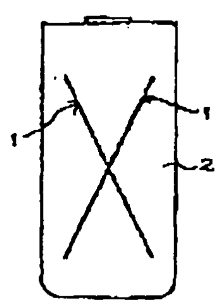


Fig. 5

Fig. 6

3 – sealing plate
2 – packing canister
1 - thin breakage safety valve

[Detailed Description of the Device]

[0001]

[Field of Industrial Use]

This device relates to rectangular batteries, to which attention has been drawn as power sources of electronic devices, and, in particular, it relates to a rectangular battery that has a safety valve that releases gas to the exterior when there is an abnormal increase of pressure inside the battery.

[0002]

[Prior Art]

Sealed batteries are equipped with safety valves for the purpose of preventing abnormal elevations of pressure. When the internal pressure rises, the safety valve opens in order to prevent an explosion of the battery. Nickel-cadmium batteries, which are widely used at present, are provided with a reverse-type safety valve that makes use of the elasticity of rubber. Rectangular nickel-cadmium batteries, which are called rubber batteries, have limited design possibilities because the width of the safety valve housing site is narrow. Moreover, they are also readily subject to the effects of heat when the sealing element is welded so that it is difficult to design a valve with which a reliable safety function can be obtained.

[0003]

Further, it is difficult to install a safety valve that operates stably in lithium batteries, in which organic solvents are used. This is because of the difficulty in selecting a rubber that is resistant to the electrolytic solution that is used in

lithium batteries. There is the possibility that the rubber of safety valves or lithium batteries will deteriorate when it is used for long periods and that leakage of fluid will occur.

[0004]

A battery having a safety valve whereby these drawbacks are eliminated is described in U.S. Patent No. 4,175,166. In the battery that is described in this patent, as depicted in Figure 1, the thin breakage safety valve 1 is installed in the packing canister 2 of a cylindrical battery that is sealed by a hermetic seal. The thin breakage safety valve 1 has a structure in which a part of the packing canister 2 is made thin so that the thin part breaks when the internal pressure rises.

[0005]

[Problems the Device Is Intended to Solve]

A battery of this structure has the advantage that leakage of fluid due to deterioration of rubber can be eliminated. However, precise control of the operating pressure of the valve is difficult in a battery of this structure and there is the danger that the internal pressure of the battery will rise. The reasons for this are that it is difficult to set a fixed rupture pressure for thin breakage safety valves that are installed in circular packing canisters and that reliability is lost.

[0006]

This device was developed for the purpose of eliminating these drawbacks. Therefore, the major object of this design is to provide a rectangular

battery in which the operating pressure of the thin breakage safety valve is precisely controlled and which battery has a safety valve of high reliability.

[0007]

[Means for Solving the Problems]

The battery of this design is provided with the structure described below for the purpose of achieving the aforementioned objectives. This device is an improved battery in which an electrode assembly having an anode and a cathode are housed in the packing canister 2, the opening of the packing canister 2 is sealed by a sealing plate, and, further, in which a part of the packing canister 2 is made in a thin state and in which is installed a thin breakage safety valve 1 that is ruptured by internal pressure. The rectangular battery of this device is characterized in that the packing canister is made in a rectangular shape and in that the thin breakage safety valve 1 is installed in a part of the corner edge other than the sealing part of the packing canister 2 so that it breaks at a precise operating pressure.

[0008]

[Action]

Just as is the case with conventional batteries, a thin breakage safety valve obtained by making a part of the packing canister thin is installed in the rectangular battery of this device. When the internal pressure of the battery rises, the thin breakage safety valve 1 is ruptured and gas is discharged. Precise operation of rectangular batteries is difficult even when a thin breakage safety valve is installed in a planar part of the packing canister. The reason for this is

that it is difficult for a thin breakage safety valve that is installed in a planar part to rupture just as in the case of a thin breakage safety valve that is installed in a cylindrical battery. With a thin breakage safety valve that does not rupture precisely, the internal pressure of the battery can rise abnormally. Further, with a thin breakage safety valve established so that a portion of the planar part is made thinner than the other parts, there are the drawbacks that deformation easily occurs in its vicinity and that the packing canister swells when the internal pressure of the battery is comparatively low.

[0009]

For the purpose of eliminating these drawbacks, the thin breakage safety valve 1 is installed at the corner edge of the packing canister 2 of the rectangular battery of this device. The thin breakage safety valve in this region ruptures at a precise operating pressure. The reason for this is that a part of the thin breakage safety valve bends when the internal pressure of the battery rises. Bending of the corner edge of the rectangular packing canister by internal pressure causes the thin breakage safety valve to rupture precisely. The internal pressure that acts on the inside face of the rectangular packing canister makes the packing canister act cylindrically. For this reason, the corner edge of the packing canister, which is bent at a right angle, bends so that it is in a planar state. Consequently, the thin breakage safety valve that is installed in the corner edge of the rectangular packing canister is bent by the internal pressure and is easily ruptured. An extremely weak force is required for pulling and breaking the metal plate. Making effective use of this same phenomenon, the thin breakage safety

valve that is installed at the corner edge is broken at a fixed pressure. This breaking phenomenon does not occur, even when internal pressure rises with a thin breakage safety valve that is installed in a cylindrical packing canister or a planar part of a packing canister. Instead, a portion of the thin breakage safety valve is bent by the internal pressure and breakage does not readily occur.

[0010]

It is not necessary to establish a planar part in the rectangular packing canister 2 having the thin breakage safety valve 1 established at the corner edge. For this reason, the strength of the planar part can be prevented from decreasing due to the thin breakage safety valve and the swelling of the battery canister can be controlled when the internal pressure of the battery is comparatively low. A thin breakage safety valve that is established at the corner edge of the packing canister can be formed by press processing. However, a precise control of the thickness can be better achieved by forming it by cutting or grinding processing. The processed part of the thin breakage safety valve that is produced by cutting and grinding is hard and brittle. Therefore, a more stable valve operating pressure can be achieved.

[0011]

An elevation of the internal pressure can be detected sensitively by installing the thin breakage safety valve in the edge of the corner that forms the largest face of rectangular batteries of different rectangular shapes of which the ratios of the areas of the five faces that form the packing canister are markedly different.

[0012]

[Examples]

We shall now describe examples of this device on the basis of the figures. The batteries that are shown below are examples that illustrate rectangular batteries for the purpose of specifying the technological concept of this design. However, the materials, shape, structure and arrangement of the structural components of the rectangular batteries of this design are not specified by what is described below. The rectangular battery of this design can be modified in various ways within the range of the registered claims.

[0013]

In order to facilitate understanding the scope of the registered claims, in this specification, the numbers corresponding to the components shown in the examples are recorded as components indicated in the "Registered Claims column," the "Action column" and the "Means for Solving the Problems column." However, the components indicated in the registered claims are not specified by the components in the examples.

[0014]

[Example A]

An electrode assembly and an electrolytic solution were introduced into the packing canister of a rectangular lithium battery of a rectangular shape and the opening was hermetically sealed by the sealing plate 3 as shown in Figure 2. The packing canister was made by press processing of an SUS304 stainless steel plate to mold it into a rectangular shape having external dimensions of 40

mm × 16 mm × 8 mm. The thickness of the packing canister was 0.25 mm. As shown in Figure 3 and Figure 4, the thin breakage safety valve 1 of a length of 40 mm was established on the corner edge. The thin breakage safety valve was formed by grinding the thickness of the packing canister from 0.1 mm up to 30 mm from the bottom. The thin breakage safety valve that has been ground and installed at the edge of the packing canister 2 was made to a hardness of Hv = 320.

[0015]

The electrode assembly (not shown in the figure) consisted of a manganese dioxide compound for the cathode and lithium metal for the anode. An organic electrolytic solution was used in the electrode assembly. After the electrode assembly and the electrolytic solution were introduced into the packing canister, a sealing plate not having a valve structure was laser-bonded to the open edge of the packing canister, with the packing canister being hermetically sealed.

[0016]

The sealing plate 3, as shown in Figure 2, is affixed through the agency of the insulating components 4, with the terminal 5 passing through its center.

[0017]

[Comparative Example B]

A rectangular battery designated as Comparison Battery B was trial manufactured in the same way as in Example A as a comparative example of the

rectangular battery of Example A except that a thin breakage safety valve was not established in the packing canister.

[0018]

Comparative Example C

A rectangular battery designated as Comparison Battery C was trial-manufactured in the same way as in Example A except that the sealing element 6, which had a rubber reverse-type valve structure of the structure shown in Figure 5 was used and that a thin breakage safety valve was not installed in the packing canister. In the sealing element 6 shown in Figure 5, the valve cap 7 was affixed to the center of the sealing plate 3 through the agency of the insulating component 4 and the rubber valve 8 is housed in the valve cap 7. The valve cap 7 hermetically connects the circumferential edges of the metal plates 7A and 7B. The upper metal plate 7A in the figure is press-molded to a shape such that its center projects upwards and a gap which houses the rubber valve 8 is housed inside it. The gas outlet hole 9 opens up in a convex pattern in the upper metal plate 7A. The valve hole 10 that is blocked by the rubber valve 8 opens up in the metal plate 7B. With a sealing element of this structure, when the internal pressure of the battery rises, the rubber valve 8 undergoes deformation and gas is discharged from the valve hole 10 through the gas outlet 9.

[0019]

[Comparative Example D]

As shown in Figure 6, the comparative battery D was trial-manufactured in the same way as Example A except that the thin breakage safety valve (thickness, 0.1 mm) of a length of 30 mm was installed in a diagonal line pattern on a planar surface of 40 mm × 16 mm of the packing canister and that the sealing element not having a valve structure as shown in Figure 2 was used.

[0020]

Ten each of the rectangular batteries of Example A and Comparative Examples B, C and D were trial-manufactured and changes relating to the occurrence of leaking of electrolytic solution and change in thickness (8 mm direction) when storage tests were performed at 80°C were determined.

[0021]

As shown in the following table, the rectangular batteries of Example A of this design did not exhibit any leaking of electrolytic solution even after the elapse of 40 days, and, moreover, the change in thickness was 0. Seven of the rectangular batteries of Comparative Example C, which had a rubber reverse-valve structure, developed fluid leakage after the elapse of 40 days, Further, there was swelling of portions of the thin breakage safety valves of the rectangular batteries of Comparative Example D, in which a thin breakage safety valve was established in the planar surface part, and, after 40 days, the thickness increased to 1.3 mm.

[0022]

[Table 1]

Battery	After 10 days		After 20 days		After 30 days		After 40 days	
	Leaks	Change in thickness (mm)	Leaks	Change in thickness (mm)	Leaks	Change in thickness (mm)	Leaks	Change in thickness (mm)
Example A	0/10	0	0/10	0	0/10	0	0/10	0
Comparative Example B	0/10	0	0/10	0	0/10	0	0/10	0
Comparative Example C	0/10	0	2/10	0	4/10	0	7/10	0
Comparative Example D	0/10	0.2	0/10	0.5	0/10	1.0	0/10	1.3

[0023]

Further, in order to determine the operating pressures of the safety valves, batteries were assembled in which an electrode assembly was not installed in the packing canister. They were designated respectively as Example A' and Comparative Examples B', C' and D' and the pressures at which the safety valves operated were determined. The results are shown in Table 2 below.

[0024]

As shown in the table, the rectangular battery of this design designated as Example A' had the advantage that the valve opening operating pressure of the thin breakage safety valve could be determined extremely precisely as 30 to 37 kg/cm^2, specifically, as 33.5 ± 3.5 kg/cm^2. By contrast, the operating pressure of the battery without a thin breakage safety valve designated as Comparative Example B' was high, 62 to 105 kg/cm^2, and, specifically, 83.5 ± 21.5 kg/cm^2. Moreover, these findings were not precise. In addition, the operating pressure of the thin breakage safety valve of the battery designated as Comparative Example D' in which the thin breakage safety valve was established on the

planar surface of the packing canister was 33.5 ± 10.5 kg/cm^2 and was not precise. In Comparison Battery C', which had a sealing element having a rubber reverse-valve structure, the safety valve could operate at a precision matching that of the batteries of this design. However, as shown in Table 1, there was the drawback that the electrolytic solution leaked.

[0025]

[Table 2]

Rectangular battery	Operating pressure (kg/cm^2)	Remarks
Example A'	30 to 37 (33.5 ± 8.5)	
Comparative Example B'	62 to 105 (83.5 ± 21.5)	Rupture of bonded component
Comparative Example C'	28 to 35 (31.5 ± 3.6)	
Comparative Example D'	23 to 44 (33.5 ± 10.5)	

[0026]

In the foregoing example, the rectangular batteries were made as lithium batteries. There is no specification that the rectangular batteries of this design have to be lithium batteries. The operating pressure of the safety valve can be precisely controlled even when used in rectangular batteries other than lithium batteries.

[0027]

By adjusting the hardness of the component in which the thin breakage safety valve is installed in addition to the thickness of the thin breakage safety valve itself, safety valves of the rectangular batteries of this design can be operated even more stably. The hardness of the thin breakage safety valve can

be adjusted by grinding the packing canister. When the hardness of the thin breakage safety valve is increased, it becomes brittle and is more easily ruptured, with operating pressure being lowered.

[0028]

[Effect of the Device]

The rectangular batteries of this design have the advantage that the operating pressure of the safety valve is precisely controlled by specifying the position on the corner edge of the packing canister in which the thin breakage safety valve is established. This is because the thin part of a thin breakage safety valve that is established at a corner edge, in addition to being pushed outward by internal pressure, is acted on by the bending force of the internal pressure that deforms it to a planar surface shape, with rupture occurring. Moreover, the thin breakage safety valve of the rectangular battery of this invention is established in the corner edge of the packing canister and it is not necessary to establish it in a planar surface part. For this reason, the thin breakage safety valve does not decrease the strength of the planar surface part and swelling of the planar surface part by internal pressure can be decreased. Thus, the rectangular batteries of this design do not use components such as rubber that easily deteriorate, stable valve operation can be carried out, swelling of the battery can be prevented, and reliability and safety can be increased. Thus, they are of extremely great industrial value.

FULL COPY OF
5-90809

(13)

(19)日本国特許庁（JP）　(12) 公開実用新案公報（U）　(11)実用新案出願公開番号

実開平5－90809

(43)公開日 平成5年(1993)12月10日

(51)Int.Cl.⁵	識別記号	庁内整理番号	F I	技術表示箇所
H01M 2/12	Z			
	101			
2/02	A			
	J			

審査請求 未請求 請求項の数1（全 2 頁）

(21)出願番号 実願平4－34193

(22)出願日 平成4年(1992)5月22日

(71)出願人 000001889
三洋電機株式会社
大阪府守口市京阪本通2丁目18番地

(72)考案者 雨堤 徹
大阪府守口市京阪本通2丁目18番地 三洋電機株式会社内

(74)代理人 弁理士 豊栖 康弘

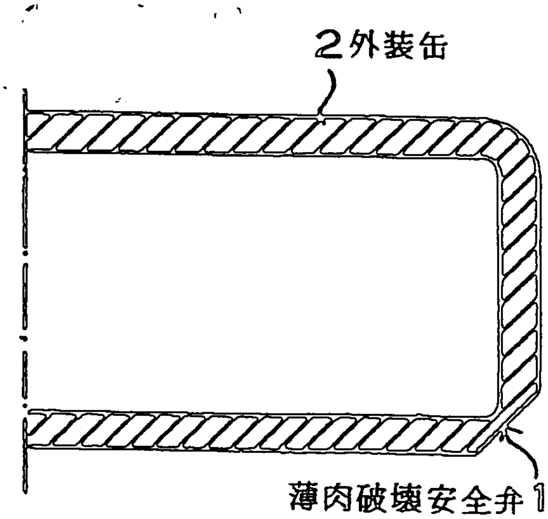
(54)【考案の名称】 安全弁を備える角形電池

(57)【要約】

【目的】 薄肉破壊安全弁の作動圧を正確に制御して高信頼性の角形電池とする。

【構成】 角形電池は、電極群を外装缶2に収納し、開口部を封口板で閉塞している。外装缶2の一部を薄く加工して、内圧で破損する薄肉破壊安全弁1を設けている。外装缶は角形で、薄肉破壊安全弁1は、外装缶2の封口部以外の陵の一部に設けている。

【効果】 薄肉破壊安全弁を外装缶の陵に設けているので、正確な作動圧で破損する。陵に設けた薄肉破壊安全弁は、内圧が上昇しても、角形電池を膨らませる等の変形の原因とならない。



Full Copy

実開平５－９０８０９

【実用新案登録請求の範囲】

【請求項１】　負極と正極とを有する電極群が外装缶(2)に収納され、外装缶(2)の開口部が封口板(3)で閉塞されており、外装缶(2)の一部が薄く加工されて、内圧で破損する薄肉破壊安全弁(1)が設けられた角形電池において、

外装缶(2)が角形で、薄肉破壊安全弁(1)が、外装缶(2)の封口部以外の陵の一部に設けられたことを特徴とする安全弁を有する角形電池。

【図面の簡単な説明】

【図１】従来の薄肉破壊安全弁を有する電池の斜視図

【図２】実施例Ａ、比較例Ｂ、Ｄの電池に使用する封口板の断面図

【図３】実施例Ａの電池の外装缶の隅部を示す断面図

【図４】実施例Ａの電池の正面図

【図５】比較例Ｃの電池に使用する封口体の断面図

【図６】比較例Ｄの電池の正面図

【符号の説明】

１…薄肉破壊安全弁

２…外装缶

３…封口板

４…絶縁部材

５…端子

６…封口体

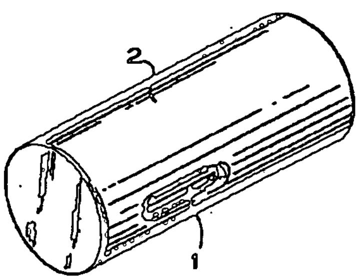
７…弁キャップ　　７Ａ…金属板　　７Ｂ…金属板

８…弁ゴム

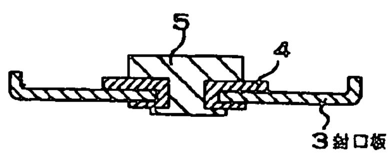
９…ガス抜口

１０…弁穴

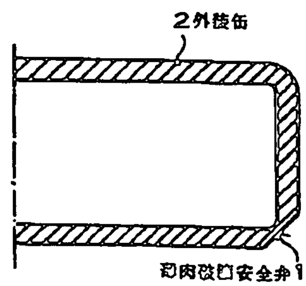
【図１】



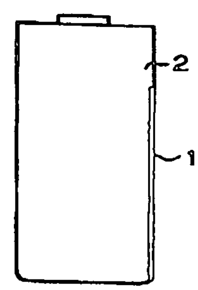
【図２】



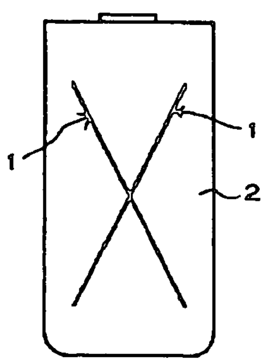
【図３】



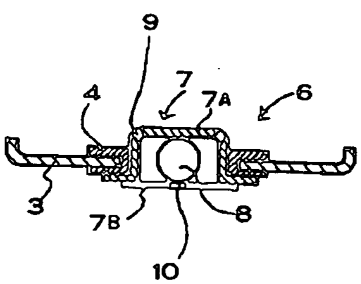
【図４】



【図６】



【図５】



【考案の詳細な説明】

【０００１】

【産業上の利用分野】

本考案は、電子機器の電源として注目されている角形電池に係り、特に電池内圧の異常上昇時に電池内のガスを外部に放出させる安全弁を有する角形電池に関するものである。

【０００２】

【従来の技術】

密閉型電池は、内圧の異常上昇を防止するために安全弁を備える。安全弁は、内圧が上昇すると開弁して、電池の爆発を防止する。現在多用されているニッケルカドミウム電池は、ゴムの弾性を利用した復帰式の安全弁を備える。ガム形電池と呼ばれる角型のニッケルカドミウム電池は、安全弁の収納場所の幅が狭いため設計の自由度が少なく、また、封口体を溶接する際の熱の影響も受け易く、確実な安全機能が得られる弁を設計するのは困難である。

【０００３】

又、有機溶媒を用いるリチウム電池は、安定に動作する安全弁を装備することが難しい。それは、リチウム電池に使用される電解液に耐性のあるゴムの選択が難しいからである。リチウム電池の安全弁は、長期間使用するとゴムが劣化して漏液する可能性がある。

【０００４】

これ等の欠点を解消する安全弁を有する電池が、米国特許第4,175,166号公報に記載される。この公報に記載される電池は、図１に示すように、ハーメチックシールにより封口した円筒形電池の外装缶２に、薄肉破壊安全弁１を設けている。薄肉破壊安全弁１は、外装缶２の一部を薄肉とし、内圧が上昇すると薄肉部分が破壊する構造としている。

【０００５】

【考案が解決しようとする課題】

この構造の電池は、ゴムの劣化による液漏れを解消できる特長がある。しかしながら、この構造の電池は、安全弁の作動圧を正確に制御することが難しく、電

池の内圧が異常に上昇して危険なことがある。それは、円筒状の外装缶に設けた薄肉破壊安全弁の破壊圧力を一定にすることが難しく、信頼性に欠けることが理由である。

【０００６】

この考案は、さらにこの欠点を解決することを目的に開発されたもので、この考案の重要な目的は、薄肉破壊安全弁の作動圧を正確に制御し、高い信頼性の安全弁を備える角形電池を提供するにある。

【０００７】

【課題を解決するための手段】

この考案の電池は、前述の目的を達成するために下記の構成を備える。この考案は、負極と正極とを有する電極群を外装缶２に収納し、外装缶２の開口部を封口板で閉塞し、さらに、外装缶２の一部を薄くして、内圧で破損する薄肉破壊安全弁１を設けた電池を改良したものである。この考案の角形電池は、外装缶を角形とするものであって、薄肉破壊安全弁１が正確な作動圧で破壊されるように、これを外装缶１の封口部以外の陵の一部に設けられたことを特徴とするものである。

【０００８】

【作用】

この考案の角形電池は、従来の電池と同じように、外装缶の一部を薄くして薄肉破壊安全弁を設け、電池内圧が上昇したときに、薄肉破壊安全弁１を破損させてガスを放出させる。角形電池は、外装缶の平面部分に薄肉破壊安全弁を設けても正確に作動させることが難しい。それは、平面部分に設けた薄肉破壊安全弁では、円筒状の電池に設けた薄肉破壊安全弁と同様に破損させるのが難いからである。正確に破損しない薄肉破壊安全弁は、電池の内圧を異常に上昇させる。また平面部分の一部を他の部分よりも薄くして設けた薄肉破壊安全弁は、その近傍が変形し易く、電池の内圧が比較的低い時点においても外装缶が膨れるという欠点がある。

【０００９】

この考案の角形電池は、この欠点を解決するために、外装缶２の陵に薄肉破壊

安全弁１を設けている。この部分の薄肉破壊安全弁１は、正確な作動圧で破損される。それは、電池の内圧が上昇すると薄肉破壊安全弁の部分が折曲されるからである。内圧による角形外装缶の陵の折曲が、薄肉破壊安全弁を確実に破壊させる。角形外装缶の内面に作用する内圧は、外装缶を円筒状にしようとする。このため、直角に折曲された外装缶の陵は平面状になるように折曲される。したがって、角形外装缶の陵に設けた薄肉破壊安全弁は、内圧で折曲されて破壊されやすくなる。金属板を引っ張って破壊すると、極めて強い力を必要とする。同じ部分を何回か折曲すると比較的簡単に切断できる。この考案の角形電池は、この現象を有効に利用して、陵に設けた薄肉破壊安全弁を一定の圧力で破壊している。円筒状の外装缶、あるいは、外装缶の平面部分に設けた薄肉破壊安全弁は、内圧が上昇してもこの現象が起こらない。内圧で薄肉破壊安全弁の部分が折曲されて、破壊されやすくなることはない。

【００１０】

さらに、陵に薄肉破壊安全弁１を設けた角形の外装缶２は、平面部分に薄肉部を設ける必要がない。このため、薄肉破壊安全弁によって平面部分の強度が低下することを防止でき、電池の内圧が比較的低い時点で外装缶が膨れることを抑制できる。さらに、外装缶の陵に設けた薄肉破壊安全弁は、プレス加工により形成することもできるが、切削あるいは研磨加工により形成することによって、厚さ精度を向上できる。さらに、切削、研磨して設けた薄肉破壊安全弁は、加工部分の硬度が硬く、脆くなるので、より安定した弁作動圧とすることができる。

【００１１】

外装缶を構成する５面の面積の比率が著しく異なる異方形の角形電池は、最も大きな面を構成する辺の長辺に薄肉破壊安全弁を設けることによって、内圧の上昇を敏感に感知することができる。

【００１２】

【実施例】

以下、この考案の実施例を図面に基づいて説明する。ただし以下に示す実施例は、この考案の技術思想を具体化するための角形電池を例示するものであって、この考案の角形電池は、構成部品の材質、形状、構造、配置を下記の構造に特定

Full Copy

するものでない。この考案の角形電池は、実用新案登録請求の範囲において、種々の変更を加えることができる。

【0013】

更に、この明細書は、実用新案登録請求の範囲を理解し易いように、実施例に示される部材に対応する番号を、「実用新案登録請求の範囲の欄」「作用の欄」および「課題を解決するための手段の欄」に示される部材に付記している。ただ実用新案登録請求の範囲に示される部材を、実施例の部材に特定するものでは決してない。

【0014】

［実施例Ａ］

異方形の角形リチウム電池は、外装缶に電極群と電解液とを充填して、開口部を、図２に示す封口板３で気密に閉塞している。外装缶は、ＳＵＳ３０４のステンレス板を絞り加工して、４０mm×１６mm×８mmの外寸法を有する角形に成形したものである。外装缶の厚さは０．２５mmである。外装缶には、図３と図４とに示すように、長さが４０mmの陵に薄肉破壊安全弁１を設けている。薄肉破壊安全弁１は、底から３０mm迄の間で外装缶２の厚さを０．１mmに研磨して形成している。研磨して外装缶２の陵に設けた薄肉破壊安全弁１は、硬度をＨｖ＝３２０とした。

【0015】

電極群（図示せず）は、正極を二酸化マンガン合剤とし、負極をリチウム金属とした。電極群には有機電解液を使用した。電極群と電解液とを外装缶に充填した後、弁構造を有さない封口板を外装缶の開口縁にレーザ溶接して外装缶を気密に閉塞した。

【0016】

封口板３は、図２に示すように、絶縁部材４を介して端子５を中心に貫通して気密に固定している。

【0017】

［比較例Ｂ］

実施例Ａの角形電池の比較例として、外装缶に薄肉破壊安全弁を設けない以外

Full Copy

実施例Ａと同様にして比較電池Ｂの角形電池を試作した。

【００１８】

［比較例Ｃ］

図５に示す構造のゴム製復帰式弁構造を有する封口体６を用い、外装缶には薄肉破壊安全弁を設けない以外、実施例Ａと同様にして、比較電池Ｃの角形電池を試作した。図５に示す封口体６は、封口板３の中心に、絶縁部材４を介して弁キャップ７を固定し、弁キャップ７内に弁ゴム８を内蔵させている。弁キャップ７は２枚の金属板７Ａ、７Ｂの周縁を気密に連結したもので、図において上の金属板７Ａは中央を上方に突出させる形状にプレス成形して、内部に弁ゴム８を内蔵する空隙を設けている。上の金属板７Ａには凸部にガス抜口９を開口している。下の金属板７Ｂは、弁ゴム８で閉塞される弁穴１０を開口している。この構造の封口体６は、電池の内圧が上昇すると、弁ゴム８が変形して、弁穴１０からガス抜口９を通過してガスが排出される。

【００１９】

［比較例Ｄ］

図６に示すように、外装缶の４０mm×１６mmの平面に、対角線状に、長さ３０mmの薄肉破壊安全弁１（厚さ０．１mm）を設け、図２に示す弁構造を有さない封口体を用いる以外実施例Ａと同様にして、比較電池Ｄを試作した。

【００２０】

実施例Ａと、比較例Ｂ、Ｃ、Ｄの角形電池をそれぞれ１０個試作し、８０℃で保存試験した際の電解液のリーク発生と厚さ（８mm方向）の変化を測定した。その結果を次の頁の表１に示している。

【００２１】

この表に示すように、この考案の実施例Ａの角形電池は、４０日経過後も、電解液のリークがなく、しかも、厚さの変化も０であった。ゴム製復帰式弁構造をする比較例Ｃの角形電池は、４０日経過後に７個の電池が液漏れを発生した。また、平面部分に薄肉破壊安全弁を設けた比較例Ｄの角形電池は、薄肉破壊安全弁の部分が膨れ、４０日後に厚さが１．３mm増加した。

【００２２】

Full Copy

【表１】

電　池	１０日後		２０日後		３０日後		４０日後	
	ﾘｰｸ	厚みの変化(mm)	ﾘｰｸ	厚みの変化(mm)	ﾘｰｸ	厚みの変化(mm)	ﾘｰｸ	厚みの変化(mm)
実施例A	0/10	0	0/10	0	0/10	0	0/10	0
比較例B	0/10	0	0/10	0	0/10	0	0/10	0
比較例C	0/10	0	2/10	0	4/10	0	7/10	0
比較例D	0/10	0.2	0/10	0.5	0/10	1.0	0/10	1.3

【００２３】

さらに、安全弁の作動圧を測定するために、外装缶に電極体を収納しない電池を組み立て、それぞれ実施例Ａ'、比較例Ｂ'、Ｃ'、Ｄ'とし、安全弁が作動する圧力を測定した。その結果を次の頁の表２に示している。

【００２４】

この表に示すように、本考案の実施例Ａ'の角形電池は、薄肉破壊安全弁の開弁作動圧を３０～３７ｋｇ／ｃm^2、すなわち３３．５±３．５ｋｇ／ｃm^2と極めて正確にできる特長がある。これに対して、薄肉破壊安全弁のない比較例Ｂの電池は、６２～１０５ｋｇ／ｃm^2、すなわち８３．５±２１．５ｋｇ／ｃm^2と作動圧が高く、また正確でない。さらに、外装缶の平面に薄肉破壊安全弁を設けた比較例Ｄ'の電池は、薄肉破壊安全弁の動作圧が３３．５±１０．５ｋｇ／ｃm^2と不正確である。ゴム製復帰式弁構造を有する封口体を有する比較電池Ｃ'は、この考案の電池に匹敵する精度で安全弁を作動できるが、表１に示すように、電解液がリークする欠点がある。

【００２５】

【表２】

Full Copy

角形電池	作動圧（ｋｇ／ｃｍ²）	備　考
実施例Ａ'	３０～３７　（３３．５±３．５）	
比較例Ｂ'	６２～１０５（８３．５±２１．５）	溶接部の破損
比較例Ｃ'	２８～３５　（３１．５±３．６）	
比較例Ｄ'	２３～４４　（３３．５±１０．５）	

【００２６】

以上の実施例は、角形電池をリチウム電池としたが、この考案の角形電池は、電池の形式をリチウム電池に特定しない。リチウム電池以外の角形電池に使用しても、安全弁の作動圧を正確に制御できる。

【００２７】

さらに、この考案の角形電池は、薄肉破壊安全弁の厚さに加えて、薄肉破壊安全弁を設ける部分の硬度を調整することによって、さらに安定して安全弁を作動させることができる。薄肉破壊安全弁の硬度は、外装缶を研磨することによって調整できる。薄肉破壊安全弁の硬度を高くすると、脆くなつて破損し易く、作動圧が低下する。

【００２８】

【考案の効果】

本考案の角形電池は、薄肉破壊安全弁を設ける位置を外装缶の陵に特定することにより、安全弁の作動圧を正確に制御して、電池の信頼性を改善できる特長がある。それは、陵に設けた薄肉破壊安全弁は、薄肉の部分が内圧で押し出されるのに加えて内圧で平面状に変形される折曲力が作用して破損されるからである。さらにまた、この考案の角形電池は、薄肉破壊安全弁を外装缶の陵に設け、平面部分に設ける必要がない。このため、薄肉破壊安全弁が平面部分の強度を低下させることがなく、内圧で平面部分が膨れるのを少なくできる。このように、この考案の角形電池は、ゴムのように劣化しやすい部材を使用することなく、安定した弁作動圧とすることができ、しかも電池の膨れを防止して信頼性と、安全性の向上でき、その工業的価値は極めて大である。

— 1ST TRANSLATION —

(19) JAPANESE PATENT OFFICE (JP)

(12) Official Gazette for Laid-Open Utility Model Applications (U)

(11) Japanese Laid-Open Utility Model Application (Kokai) No. 5[1993]-90,809

REJECTED OVER 52-149,332 attached

(43) Laying-Open Date: 10 December 1993

(51) Int.Cl.2	Ident. Symbols	Internal Office Nos.
H 01 M 2/12	Z	
	101	
2/02	A	
	J	

Request for Examination: Not yet requested

Number of Claims: 1 Total of 2 pages)

(21) Application No.: 4[1992]-34,193*

(22) Application Date: 22 May 1992

(71) Applicant: 00001889*
Sanyo Battery Company, Ltd.
18 Keihan Hondori 2-chome, Moriguchi-shi, Osaka-fu

(72) Inventor: [illegible]
c/o Sanyo Battery Company, Ltd.
18 Keihan Hondori 2-chome, Moriguchi-shi, Osaka-fu

(74) Agent: [illegible], Patent Attorney

(54) [Name of Device]: A Rectangular Battery Equipped with a Safety Valve

(57) [Abstract]

[Objective] A rectangular battery of high reliability in which the operating pressure of the thin breakage safety valve is precisely controlled.

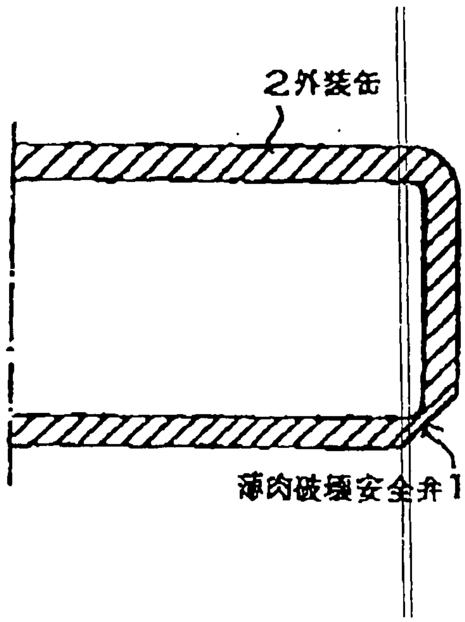
[Structure] In the rectangular battery, the electrode assembly is housed in the packing canister 2 and the opening is sealed by a sealing plate. A portion of the packing canister 2 is processed to a thin state and the thin breakage safety valve 1 that is broken down by internal pressure is installed. The packing

1st Trans.

canister is rectangular and the thin breakage safety valve 1 is intalled in a part of the corner at a place other than where the sealing plate of the packing canister 2 is installed.

[Effect] Because the thin breakage safety valve is installed in a corner of the packing canister, breakage occurs at a precise operating pressure. The thin breakage safety valve, which is installed in [illegible], is not the cause of deformation such as swelling of the rectangular battery even when internal pressure rises.

/st TRANS.



[keyed top to bottom]:

2 – packing canister

1 – thin breakage safety valve

1st Trans

[Claim]

A rectangular battery that has a safety valve, which is characterized

in that it is a rectangular battery in which an electrode assembly having an anode and a cathode are housed in the packing canister (2), in which the opening window of the packing canister (2) is sealed by the sealing plate (3), in which a part of the packing canister (2) is processed to a thin state and in which is installed the thin breakage safety valve (1) that breaks under internal pressure, [and]

in that the packing canister (2) is rectangular and in that the thin breakage safety valve (1) is installed in a part of the cornerother than the place where the sealing plate is installed.

[Brief Explanation of the Figures]

[Figure 1] This is an oblique view of a battery that has a conventional thin breakage safety valve.

[Figure 2] This is a cross-sectional view of the sealing plate that is used in the batteries of Example A and Comparative Examples B and D.

[Figure 3] This is a cross-sectional view that shows the battery of the packing canister that is important in Example A.

[Figure 4] This is a frontal view of the battery of Example A.

[Figure 5] This is a cross-sectional view of the sealing plate that is used in the battery of Comparative Example C.

[Figure 6] This is a frontal view of the battery of Comparative Example D.

4

1ST TRANS.

[Explanation of Symbols]

1 ----- thin breakage safety valve

2 ----- packing canister

3 ----- sealing plate

4 ----- insulating material

5 ----- [illegible]

6 ----- sealing element

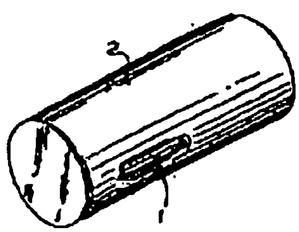
7 ----- valve cap; 7A – metal plate; 7B – metal plate

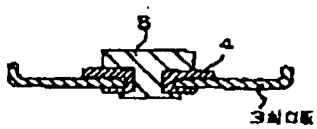
8 ----- valve rubber

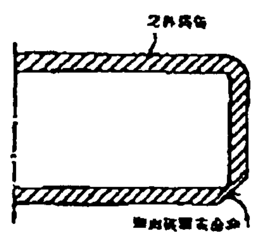
9 ----- gas [illegible]

10 --- valve opening

FIG 2.







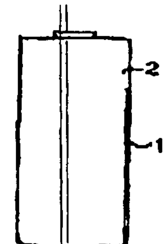
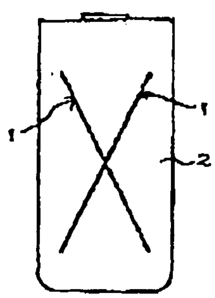


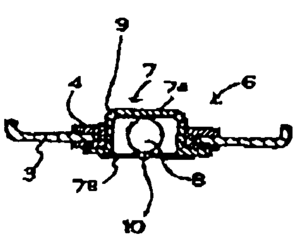
FIG 4

FIG 3

【図6】



【図5】



3 – sealing plate
2 – packing canister

1ST TRANS.

1 -̇ thin breakage safety valve
*Number is somewhat illegible—Trans. Note.